Algebra 3
Review - Polynomials

Name _____
Per _____ Date _____

1. Which of the following are polynomials?

a. $f(x) = x + 2$

b. $f(x) = 5$

c. $f(x) = x^2 - 9$

d. $f(x) = \sqrt{9x}$

e. $f(x) = \frac{1}{x+3}$

f. $f(x) = x^2 + \frac{x}{2} - 3$

2. Name the degree for each of the following.

a. $f(x) = x^2 + x + 3$

b. $f(x) = x - 2$

c. $f(x) = -3$

d. $f(x) = x^5 + x^4 - 2x^3 + 3x^2 + x - 1$

3. Graph the following functions on your calculator. Then find: ① x-intercept(s) ② y-intercept ③ all real zeros ④ local minimums and local maximums. Finally, sketch the graph and label the windows. Round any decimals to 2 places.

a. $f(x) = x^2 - x - 20$

b. $f(x) = x^3 - 3x^2 + 2x - 1$

c. $f(x) = x^3 - 3x^2 - 2x + 1$

d. $f(x) = x^3 + 3x^2 - 2x - 1$

Algebra II
WS Curve of best fit III – Review

Name _____
Per ____ Date _____

1) **Height versus Weight** A doctor wished to determine whether a relation exists between the height of a female and her weight. She obtained the heights and weights of 10 females aged 18 to 24. Let height be the independent variable, X, measured in inches, and weight be the dependent variable, Y, measured in pounds.

X (height)	60	61	62	62	64	65	65	67	68	68
Y (weight)	105	110	115	120	120	125	130	135	135	145

(a) Use a graphing utility to draw a scatter diagram.
(b) Use a graphing utility to find the line of best fit to the data.
(c) Interpret the slope.
(d) Predict the weight of a female aged 18 to 24 whose height is 66 inches.

2) **Height of a Ball** A physicist throws a ball at an inclination of 45° to the horizontal. The data below represents the height of the ball h at the instant it has traveled x feet horizontally.

Distance, x	Height, h
20	25
40	40
60	55
80	65
100	71
120	77
140	77
160	75
180	71
200	64

(a) Using a graphing utility, draw a scatter diagram of the data. Comment on the type of relation that may exist between the two variables.
(b) Find the quadratic function of best fit.
(c) Using a graphing utility, draw the quadratic function of best fit on your scatter diagram.
(d) Using the function found in (b), how far will the ball travel before it reaches its maximum height?
(e) Using the function found in (b), determine the maximum height of the ball.
(f) Compare your result in (d) and (e) to the data.
(g) Determine the horizontal distance the ball will travel based on the function found in (b).

3) **Motor Vehicle Thefts** The following data represents the number of motor vehicle thefts (in thousands) in the United States for the years 1983–1993, where 1 represents 1983, 2 represents 1984, and so on.

Year, x	Motor Vehicle Thefts, M
1983, 1	1,008
1984, 2	1,032
1985, 3	1,103
1986, 4	1,224
1987, 5	1,289
1988, 6	1,433
1989, 7	1,565
1990, 8	1,636
1991, 9	1,662
1992, 10	1,811
1993, 11	1,561

Source: U.S. Federal Bureau of Investigation.

(a) Using a graphing utility, draw a scatter diagram of the data. Comment on the type of relation that may exist between the two variables.
(b) Find the cubic function of best fit.
(c) Using a graphing utility, draw the cubic function of best fit on your scatter diagram.
(d) Use the function found in (b) to predict the number of motor vehicle thefts in 1994.
(e) Do you think the function found in (b) will be useful in predicting the number of motor vehicle thefts in 1999?

OMIT

4) **Advertising and Sales Revenue** A marketing firm wishes to find a function that relates the sales S of a product and A, the amount spent on advertising the product. The data are obtained from past experience. Advertising and sales are measured in thousands of dollars.

Advertising Expenditures, A	Sales, S
20	335
22	339
22.5	338
24	343
24	341
27	350
28.3	351

(a) Does the relation defined by the set of ordered pairs (A, S) represent a function?
(b) Using a graphing utility, draw a scatter diagram of the data.
(c) Using a graphing utility, find the line of best fit relating advertising expenditures and sales.
(d) Interpret the slope.
(e) Express the relationship found in (c) using function notation.
(f) What is the domain of the function?
(g) Predict sales if advertising expenditures are $25,000.

14. Use your graphing calculator to find each of the following for $f(x) = -x^2 - 2x + 3$. If necessary, round to 2 decimal places.

a. vertex _____ b. maximum or minium _____

c. range _____ d. axis of symmetry _____

e. y – intercept _____ f. x – intercepts _____

_____

15. Solve by factoring: a. $3x^2 + 5x + 2 = 0$ b. $x^2 - 4x - 12 = 0$

16. For the given rational function, $f(x) = \frac{12x}{x^2 - 7x + 6}$, find:

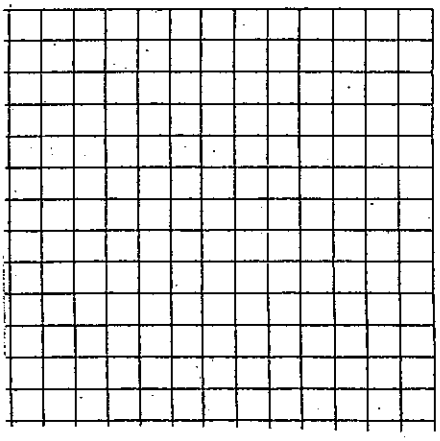
a. domain _____ b. x – intercept _____

c. y – intercept _____ d. vertical asymptote _____

e. horizontal asymptote _____ f. holes: _____

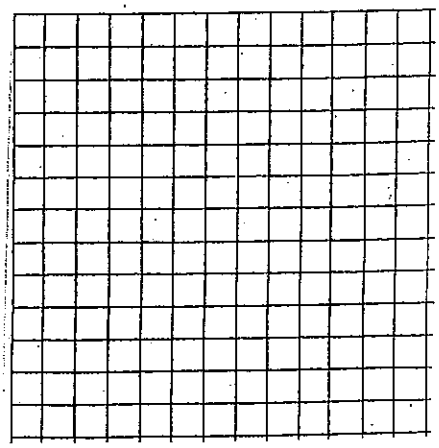
g. key points

h. Sketch the graph.



17. Revenue Function: $R(x) = x(119-6x)$
Cost Function: $C(x) = 234 + 23x$

a. Form a profit function, P, and graph R, C, and P and sketch the graph.



b. When is there a profit?

c. When is there a loss?

d. What is the maximum profit (to the nearest thousand dollars)?

e. What is the output (to the nearest unit) that produces the maximum profit?

18. The financial department of a company that manufactures surfboards has fixed costs of $500 per day and total costs of $3500 per day at an output of 100 surfboards per day. Assume the cost C(x) is linearly related to output x.

a. Find an expression for the cost function C(x) and the average cost function $\overline{C}(x)$.

b. Sketch a graph of the average cost function for $5 \leq x \leq 200$.

c. Identify any asymptotes.

d. What does the average cost approach as production increases?

19. The cost C(x) in dollars for handling x cases per month in a veterinary clinic is given by $C(x) = 0.00048(x-500)^3+60{,}000$. The average cost function $\overline{C}$ is given by $\overline{C}(x) = \frac{C(x)}{x}$.

a. Write an equation for the average cost function.

b. Graph the average cost function for $100 \leq x \leq 1000$.

c. What is the monthly caseload for the minimum average cost per case?

d. What is the minimum average cost per case?

~~Algebra 3~~
Review - Polynomials

Name Key
Per ____ Date ____

1. Which of the following are polynomials?

a. $f(x) = x + 2$ yes
b. $f(x) = 5$ yes
c. $f(x) = x^2 - 9$ yes
d. $f(x) = \sqrt{9x}$ no
e. $f(x) = \frac{1}{x+3}$ no
f. $f(x) = x^2 + \frac{x}{2} - 3$ yes

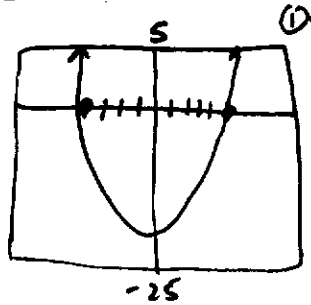
2. Name the degree for each of the following.

a. $f(x) = x^2 + x + 3$ 2
b. $f(x) = x - 2$ 1
c. $f(x) = -3$ 0
d. $f(x) = x^5 + x^4 - 2x^3 + 3x^2 + x - 1$ 5

3. Graph the following functions on your calculator. Then find: ① x-intercept(s) ② y-intercept ③ all real zeros ④ local minimums and local maximums. Finally, sketch the graph and label the windows. Round any decimals to 2 places.

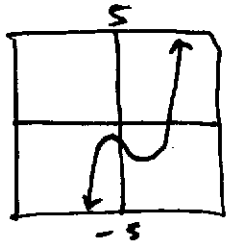
a. $f(x) = x^2 - x - 20$
b. $f(x) = x^3 - 3x^2 + 2x - 1$
c. $f(x) = x^3 - 3x^2 - 2x + 1$
d. $f(x) = x^3 + 3x^2 - 2x - 1$

a)



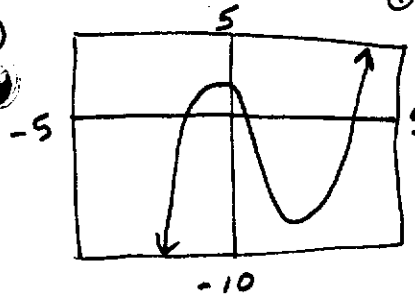
①+③ x-int/zeros
$x = -4 + 5$
② $y = -20$ (y-int)
④ min (.50, -20.25)

b)



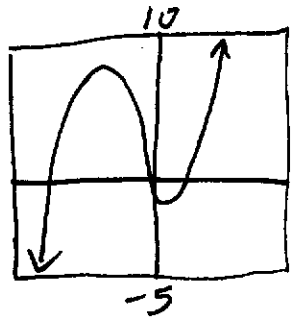
①+③ x-int/zeros
$x = 2.32$
② y-int $y = -1$
④ max (.42, .62)
min (1.58, -1.38)

c)



①+③ x-int/zeros
$x = -.83, .34, 3.49$
② y-int $y = 1$
④ max (-.29, 1.30)
min (2.29, -7.30)

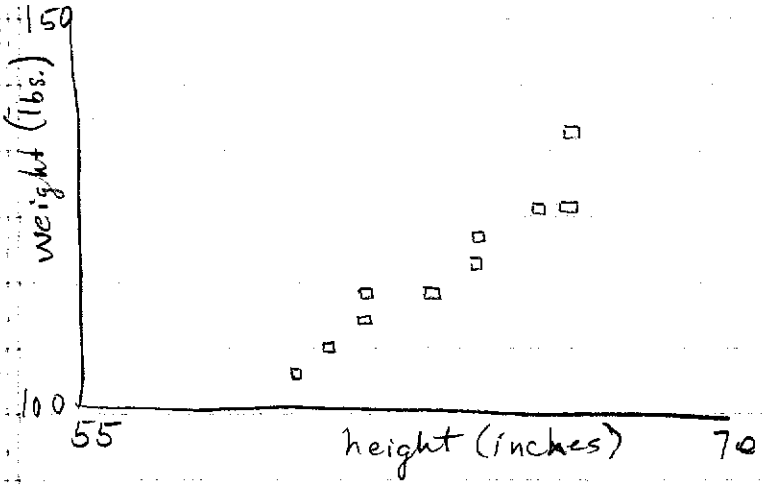
d)



①+③ x-int/zeros
$x = -3.49, -.34, .83$
② y-int $y = -1$
④ max (-2.29, 7.30)
min (.29, -1.30)

Height vs. Weight

a)



b) $y = 4.1270x - 140.9524$

c) slope $= \frac{\text{rise}}{\text{run}} \left(\frac{\cancel{y}}{\cancel{x}}\right) \rightarrow \frac{4.1270}{1}$

As height increases by 1 inch, weight increases by about 4.13 lbs.

d) $y = 4.1270(66) - 140.9524$

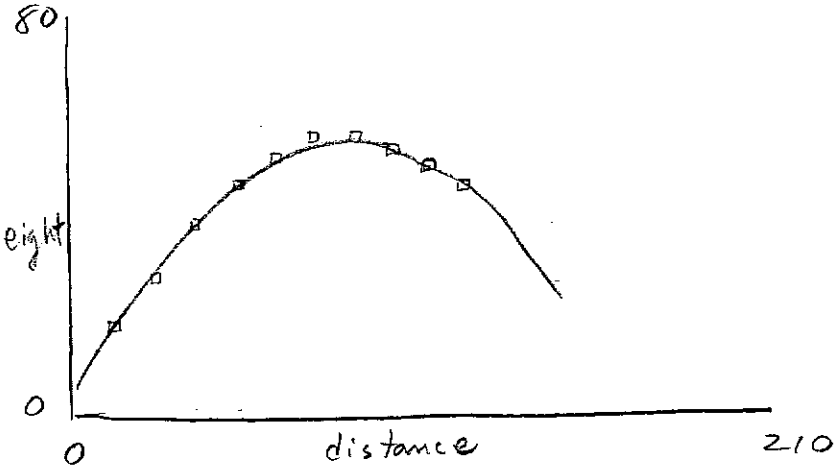
$y = 272.3820 - 140.9524$

$y = 131.4296$ lbs $\approx$ 131 lbs.

Height of a Ball

a)

c)



b) $y = -.0037x^2 + 1.0318x + 5.6667$

d) Maximum x-value $\approx$ (139.4 ft.)

e) Maximum y-value $\approx$ (77.6 ft.)

f) $0 = -.0037x^2 + 1.0318x + 5.6667$

2nd trace zero for right zero of parabola

Or

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ solve for x when

$a = -.0037$

$b = 1.0318$

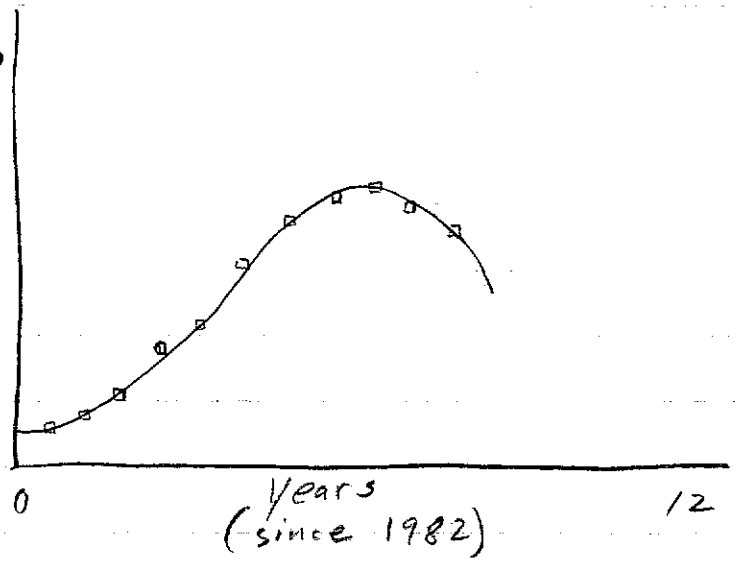
$c = 5.6667$

total distance traveled $\approx$ (284.2 ft.)

Motor Vehicle Thefts

a) 1700

c)



b) $y = -2.4324x^3 + 37.3170x^2 - 70.3718x + 1043.7879$

d) $y = -2.4324(12)^3 + 37.3170(12)^2 - 70.3718(12) + 1043.7879$

$y = -4203.1872 + 5373.6480 - 844.4616 + 1043.7879$

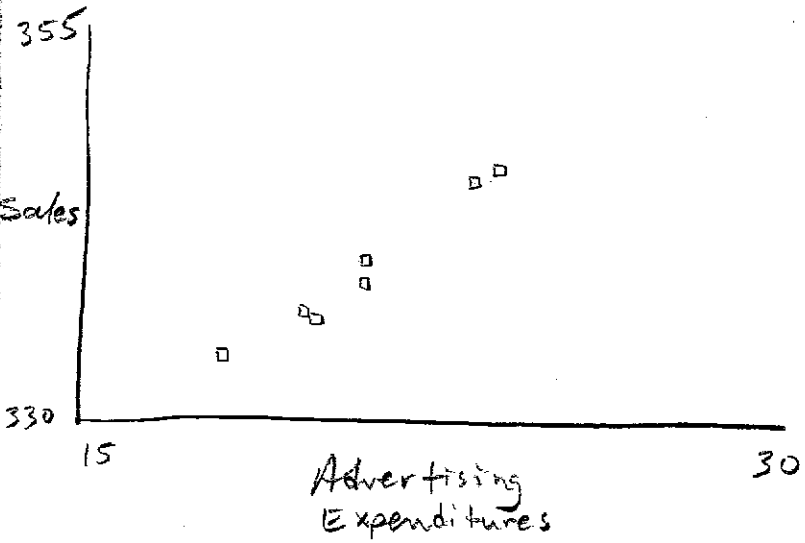
$y = 1369.7871$

$y \approx$ 1370 motor vehicle thefts

e)

Advertising and Sales Revenue

b)



a) no

c) $y = 2.067x + 292.887$

d) slope $\rightarrow \frac{2.067}{1} \rightarrow \frac{2067}{1000}$

for every $1000 spent on advertising, sales increase by $2067.

e) $f(x) = 2.067x + 292.887$

f) domain ≥ 0 because advertising $ spent cannot be negative.

g) $y = 2.067(25) + 292.887$

$y = 344.562 = \$344,562$ in sales

14. Use your graphing calculator to find each of the following for $f(x) = -x^2 - 2x + 3$. If necessary, round to 2 decimal places.

a. vertex $-1, 4$

b. maximum or minium $-1, 4$

c. range $y \leq 4$

d. axis of symmetry $x = -1$

e. y – intercept $y = 3$

f. x – intercepts $x = -3$, $x = 1$

15. Solve by factoring: a. $3x^2 + 5x + 2 = 0$

$(3x+2)(x+1) = 0$

$x = -1, -2/3$

b. $x^2 - 4x - 12 = 0$

$(x-6)(x+2) = 0$

$x = 6, -2$

16. For the given rational function, $f(x) = \frac{12x}{x^2 - 7x + 6}$, find:

$(x-6)(x-1)$

a. domain $\mathbb{R}, x \neq 6, 1$

b. x – intercept 0

c. y – intercept 0

d. vertical asymptote $x = 6$ $x = 1$

e. horizontal asymptote $y = 0$

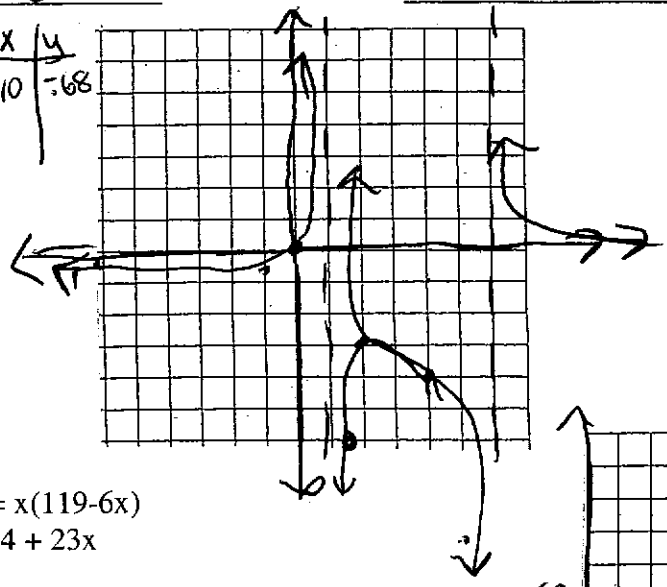
f. holes: none

g. key points

x	y
-1	-.86
2	-6
4	-8
5	-18

x	y
-10	-.68

h. Sketch the graph.

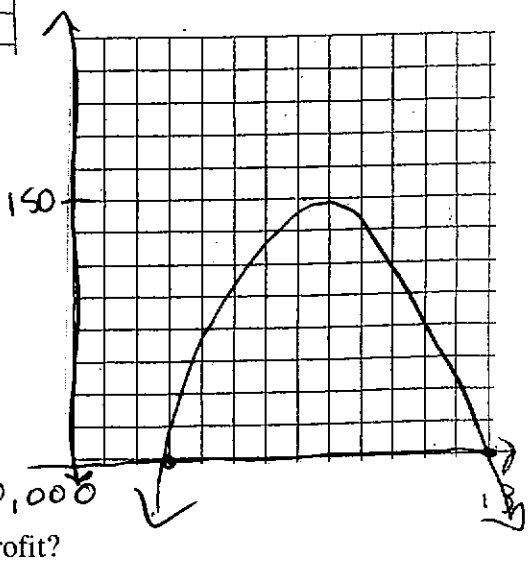


$\frac{-12}{1+7+6}$

17. Revenue Function: $R(x) = x(119-6x)$
Cost Function: $C(x) = 234 + 23x$

a. Form a profit function, P, and graph R, C, and P and sketch the graph.

$119x - 6x^2 - 234 - 23x = -6x^2 + 96x - 234$



b. When is there a profit?

$3 < x < 13$

c. When is there a loss?

$x < 3 \quad x > 13$

d. What is the maximum profit (to the nearest thousand dollars)?

e. What is the output (to the nearest unit) that produces the maximum profit?

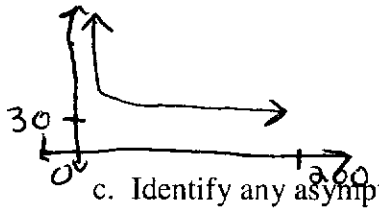
18. The financial department of a company that manufactures surfboards has fixed costs of $500 per day and total costs of $3500 per day at an output of 100 surfboards per day. Assume the cost C(x) is linearly related to output x. (0, 500) (100, 3500) $\frac{3000}{100} = 30$

a. Find an expression for the cost function C(x) and the average cost function $\overline{C}(x)$.

$C(x) = 30x + 500$

$\overline{C}(x) = \frac{30x + 500}{x}$

b. Sketch a graph of the average cost function for $5 \leq x \leq 200$.



c. Identify any asymptotes. $y = 30$ $x = 0$

d. What does the average cost approach as production increases?

$30

4. The cost C(x) in dollars for handling x cases per month in a veterinary clinic is given by $C(x) = 0.00048(x-500)^3 + 60{,}000$. The average cost function $\overline{C}$ is given by $\overline{C}(x) = \frac{C(x)}{x}$.

a. Write an equation for the average cost function. $\frac{.00048(x-500)^3 + 60{,}000}{x}$

b. Graph the average cost function for $100 \leq x \leq 1000$.

c. What is the monthly caseload for the minimum average cost per case? 90 cases

d. What is the minimum average cost per case?

$750